



makers want to try and avoid excess processing capacity. However, a shortage of equipment, even for one season, may result in substantial wine grape spoilage and so loss of production income. These difficulties particularly extend to the currently adopted container arrangements where rigid containers provide wine makers with fixed grape handling and fermenting capacities, and thus little scope for effectively accommodating fluctuating grape volumes.

An additional problem with these container arrangements is that their cleaning and recharging is time consuming and costly. That is more so given that it necessitates down time in the use of the containers during their most productive period.

### **Summary of the Invention**

An object of the present invention is to provide an alternative container apparatus which is both relatively simple and inexpensive. As a consequence, the apparatus is particularly suited for handling seasonally fluctuating volumes of flowable material such as crushed grapes and other fruit during wine production.

Another object of the present invention is to provide container apparatus which requires reduced cleaning, or can be readily disposed of, following use.

A further object of the present invention is the provision of container apparatus which has reduced storage requirements when not in use.

Another object of the present invention is the provision of a simple and inexpensive method for handling flowable material such as crushed grapes and other fruit during wine production.

An additional object of the present invention is the provision of a bag container suitable for use in the container apparatus and method.

In one aspect, the present invention provides a container apparatus for handling fruit must, including a holding container composed of flexible sheet material for holding a quantity of fruit must, the holding container having at least one opening for removing at least juice of the must or wine, therefrom.

In a further aspect, the present invention provides a container apparatus for handling fruit must, including: a rigid support structure; and, a flexible container for holding a quantity of fruit must, the holding container being

Preferably, the apparatus also includes control means for applying a force to the must causing the must juice or wine to flow out through the or at least one opening in the holding container. That control means force preferably causes the must to be pressed and juice to be separated from fruit  
5 pulp and skins of the must.

Preferably, the control means includes a control member. That member is inflatable to apply the force and press against the must. The control member includes an inflatable control container having a control compartment expandable under pressure of fluid introduced into the control compartment so  
10 as to inflate the control container, in one preferred form.

In one preferred arrangement, the control container is located between the holding container and the rigid support structure. The rigid support structure restrains the control container and controls the direction of inflation of the control container toward the holding container so as to apply a force to the  
15 holding container.

In one form, the control container is located beneath the holding container. In this form, inflation of the control container causes the bottom of the holding container to progressively rise so as to press the must juice between the rising container bottom and a top of the holding container. The  
20 control container preferably at least partially surrounds the holding container in this form so that inflation of the control container causes the holding container to deflate and apply a force to the must. The control container may extend over the top and about the side(s) of the holding container, in this form.

In another preferred arrangement, the holding container is located  
25 between the control container and the rigid support structure. With this arrangement, the rigid support structure restrains the holding container as the control container inflates so as to apply a force to the must.

In one form, the holding container at least partially surrounds the control container. In this form inflation of the control container causes the must to  
30 progressively compress outwardly against the rigid support structure. The control container may be located within the holding container.

The holding bag sheet material may be a laminate of two or more sheets in order to provide the above and other acceptable characteristics for the container, having regard to its intended application. Those other characteristics may include being durable and strong. One or more sheets  
5 may be composed of plastics such as nylon, and one or more other sheets may be composed of metal such as aluminium. The sheet material will be typically of food grade quality, at least where it comes into contact with the must in the exemplary application of the apparatus.

In one preferred form, the holding container defines a compartment for  
10 holding the fruit must and with which the opening communicates. The opening is located at or adjacent the top of the container, in a preferred form. That opening is located centrally within a top wall of the holding bag container, in one form.

The upper opening is relatively small compared with the size and  
15 holding capacity of the container. The must preferably flows in a pipe through this opening into the holding compartment and the juice or wine flows out through the opening, in one form. The container may have a connection facility at the opening to enable a pipe to be connected to the container at that opening so as to facilitate fluid flow into and out of the compartment without  
20 spillage.

Preferably, the apparatus further includes means for controlling the temperature of the fruit must in the holding container. That temperature control means preferably includes a passageway adjacent the holding container, passage of heat exchange fluid through the passageway causing convected  
25 transfer of heat between the heat exchange fluid and the must in the holding container. In one preferred form, the passageway is provided by the control compartment. In this form, the control container has at least two openings into the control compartment to enable flow of heat exchange fluid into and out of the openings, respectively.

30 In at least one preferred form, the support structure for the holding container provides at least side support so as to prevent the container from laterally shifting upon any movement of the compartment contents. To that

tube extends within the gas discharge tube into the container to a level beneath that at which the cap forms. Thus, in use, the ferment tube protrudes through the cap into the fermenting grape juice thereby providing communication for the ferment gas through the cap into the gas discharge  
5 tube.

In one form, the fermentation tube extends from a lower end opening below the level at which the cap forms, through the container opening, to an upper end opening in the gas discharge tube. The fermentation tube has a smaller cross-sectional dimension than the gas discharge tube so that a  
10 passage is defined between them. With this arrangement, in use, pressure build up in the container forces fermenting juice and the ferment gas up through the fermentation tube. As the juice and gas flow from the open upper end of the fermentation tube into the discharge tube, the juice returns through the passage, under influence of gravity, to the container, whilst the ferment gas  
15 escapes through the discharge tube to the atmosphere. The fermenting juice flowing onto the skins helps irrigate them and extract colour into the juice.

In a preferred form of the present invention, the fruit must is pumped or otherwise poured into the holding compartment. When the must is supplied through a hose or pipe, then that hose or pipe may be connected or coupled to  
20 the connection facility at the opening, although that is not necessary. In this form, the holding container is positioned in the support crate prior to must supply. The container is typically completely filled with the must.

#### **Brief Description of the Drawings**

It will be convenient to hereinafter describe the invention in greater  
25 detail by reference to the accompanying drawings which illustrate two embodiments of the invention applied to a container apparatus and method for handling crushed grapes or grape must. The particularity of the drawings and the related description is not to be understood as superseding the generality of the preceding broad description of the invention.

30 In the drawings (where the same reference numerals identify the same components or features):

litres, although it will be appreciated that other compartment volumes may be selected for particular applications. The compartment 8 is defined by a top wall 9, bottom wall 10 and one or more side walls 11 extending therebetween.

The container 7 is composed of flexible plastic and/or metal laminate sheet material. Where the apparatus 1 is used for fermenting juice J then at least the top wall 9 will be composed of stretchable material allowing it to distend into a dome shape under pressure generated during the fermentation process. In the exemplary application, the container 7 will typically have a single use life, ie the handling of one batch quantity of grapes or must M prior to disposal.

An opening 12 is provided in the top wall 9 for supply of grapes or must M into the holding compartment 8 and removal of grape juice J or wine therefrom. The container 7 is closed from liquid flow into and out of the holding compartment 8 except through opening 12. The opening 12 is defined by a pipe or hose coupling 13 fitted into the top wall 9 and to which a pipe or hose H can be connected for flow of grapes or must M, and juice J or wine therethrough. The coupling 13 may be seam welded or otherwise sealed into the top wall 9, and provide any suitable sealed connection to the pipe or hose H.

The apparatus 1 further includes a gas discharge tube 14 releasably connectable to the coupling 13. That discharge tube 14 extends externally of the container 7 to an open end 15 communicating with the surrounding atmosphere.

In addition, a ferment tube 16 is fitted within the discharge tube 14. That tube 16 extends from an open lower end 17 within holding compartment 8 to an open upper end 18 within the discharge tube 14 below the open end 15 thereof. The ferment tube 16 is of a smaller cross sectional size than the discharge tube 14 so as to define flow passage 19 therebetween.

The apparatus 1 further includes control means 20 operable to apply an external force to the container 7 so as to cause it to be compressed or collapse. The control means 20 includes a control member 21 which, in this embodiment, is constructed integral with the container 7. It should be

Frictional contact between the crate side walls 4 and container side walls 11 may be sufficient to restrain the entire container 7 within storage space 5 against riding upwardly on the expanding control container 22. However, an auxiliary restraint, such as tie down straps (not shown) may be provided so as to restrain container 7 against that upward movement.

Continued expansion of the control compartment 25 causes the juice J to commence flowing out of the holding compartment 8 through the opening 12. Another hose H" may be connected to coupling 13 as shown in that Fig. 4 to enable the juice J to be taken away for further processing. The skins S within the crushed grapes or must M will tend to float upwardly within the grapes or must M and accumulate against the top wall 9. The restricted size of the opening 12, and relatively slow expansion of the control compartment 25 minimises entrainment of those skins S in the juice J being removed from the compartment 8.

Expansion of the control compartment 25 continues until the compartment 25 is fully expanded and all of the free running juice J is removed from the compartment 8 as shown in Fig. 5. In addition, the fruit pulp and skins S may undergo some pressing during the final expansion of the compartment 25, releasing further juice J from the grapes or must M.

The control compartment 25 is then emptied through reverse flow of the low pressure water through hose H'. The integral containers 7 and 22 can then be removed from the crate 2 and container 7 slashed open to access the retained skins S. Those skins S may undergo a secondary pressing in separate equipment for removal of any residual juice J and eventually composted or discarded.

In using the apparatus 1 to ferment the grape juice J into wine, after pumping the grapes or must M into the holding compartment 8, the gas discharge tube 14 is connected to the coupling 13. The must M is then inoculated with a fermentation yeast.

As fermentation commences, the skins S are forced toward the top wall 9 under influence of ferment gas produced during the fermentation. That gas rises through the grapes or must M and escapes via the discharge tube 14.

compartment 25' to cause juice or wine to be removed from the compartment 8 as described above in relation to the previous embodiment. Opening 26' is defined by a pipe or hose coupling 27' for connection of a pipe or hose H' supplying the low pressure fluid into the compartment 25'.

5           Only one opening 26' is required for pressurising the compartment 25'. However, as shown in this embodiment, a pair of spaced apart openings 26' can be provided. These openings 26' can function as an inlet and outlet respectively for flow of heat exchange fluid through the compartment 25'. Thus, for example, during the fermentation process, a fluid can flow through an  
10       inlet opening 26' to circulate within the compartment 25' about container 7 before exiting through the outlet opening 26'. That fluid may be either a liquid or gas, and may be heated or cooled so as to control the temperature of the must M in the container 7 during the fermentation process.

          In a variation of the embodiment described with reference to Fig. 6, the  
15       function of the holding container 7 and the control container 22' are reversed. That is, the control container 22' becomes the holding container 7 holding a quantity of must M in the control compartment 25, whilst the holding container 7 acts as the control container 22' to force the juice J from the control compartment 25 out through opening 26'. With this variation, pressure fluid is  
20       introduced by hose H into the holding compartment 8 through opening 12 causing the holding container 7 to inflate and apply a force to the must M in the control compartment 25. That force causes the juice J to flow out through opening 26'. The juice J can be removed through hose H'.

          A further embodiment of the apparatus is shown in Fig. 7 of the  
25       drawings. That drawing again shows the apparatus 1 in the same stage of use as shown in Figs. 3 and 6 of the previous embodiments.

          In this embodiment, apparatus 1 incorporates an inner bag like holding container 7" and an outer bag like control container 22" manufactured together in a pillow-like construction. Thus, the holding container 7" and control  
30       container 22" are each fabricated from flat pieces of sheet material welded or otherwise sealed together along their edges to form seam 28" extending continuously about the edges of the sheet material pieces. With this



Examples of suitable sheet materials for containers of apparatus embodiments shown in Figs. 6 and 7 of the drawings, when used for grape fermentation and maturation, are as follows:

#### **Red Wine Fermentation**

- 5           A control container comprising two layers of 150 micron ultrastrong blended polyethylene.

A holding container comprising a single layer of 80 micron food contact polyethylene.

#### **White Wine Fermentation**

- 10           A control container comprising a single layer of 112 micron metallised polyester.

A holding container comprising two layers of 100 micron food contact polyethylene.

- 15           The metallised polyester layer minimises transmission of carbon dioxide and oxygen between the must M and external environment, whilst the polyethylene layers provide excellent integrity and overall container strength.

#### **Wine Maturation**

- 20           The containers can be made in different materials to provide different levels of oxygen permeability. Control and holding containers each comprising a single layer of 100 micron linear polyethylene would allow approximately 1000cc/M<sup>2</sup>/24 hours (100% oxygen) at 25°C. Such a container construction could be used for rapid maturation.

- 25           Holding containers made from various thicknesses of polyethylene sheet material, and control containers made of nylon co-extrusion would allow varying levels of carbon dioxide and oxygen to permeate to the holding compartment, creating opportunities for medium and slow maturation of between approximately 80 and 250cc/M<sup>2</sup>/24 hours (100% oxygen) at 25°C.

- 30           It will be appreciated from the foregoing description that the apparatus, container and method are relatively simple and inexpensive. They are particularly suitable for handling crushed fruit and must, and other flowable materials, where the volume of material to be handled is difficult to predict and has seasonal fluctuations. In that regard, the apparatus and container provide

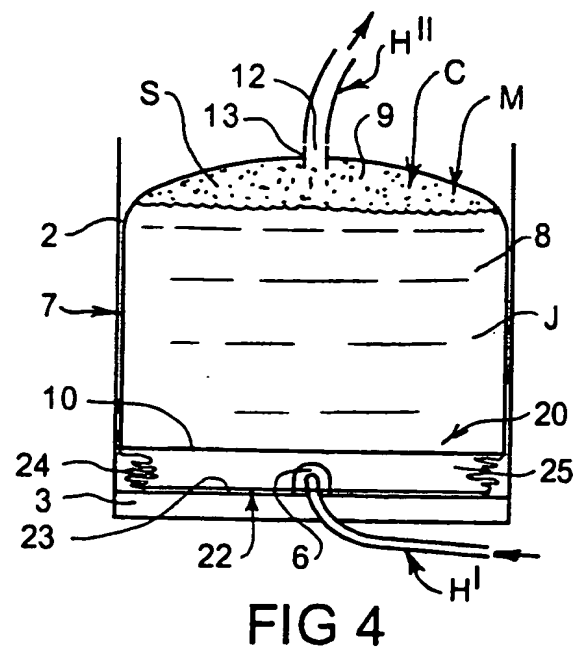
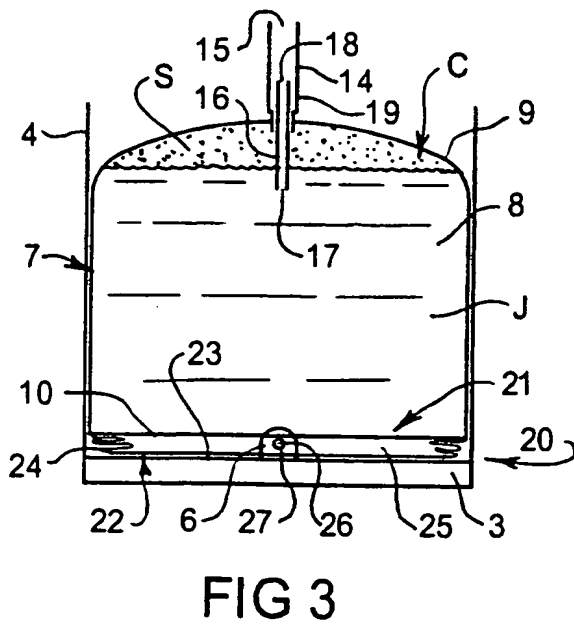
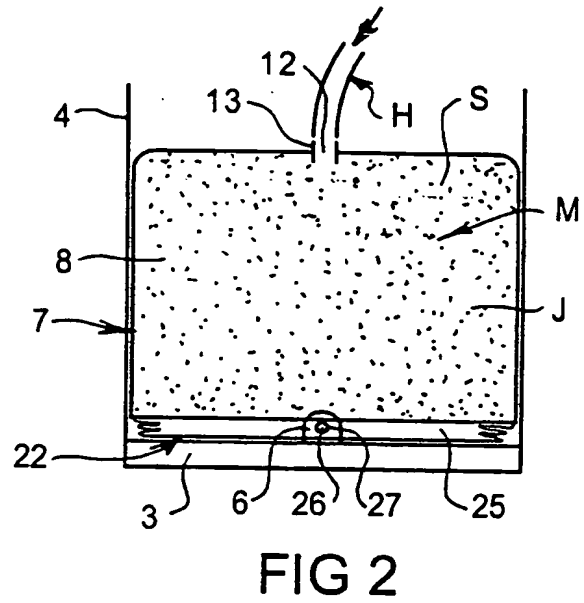
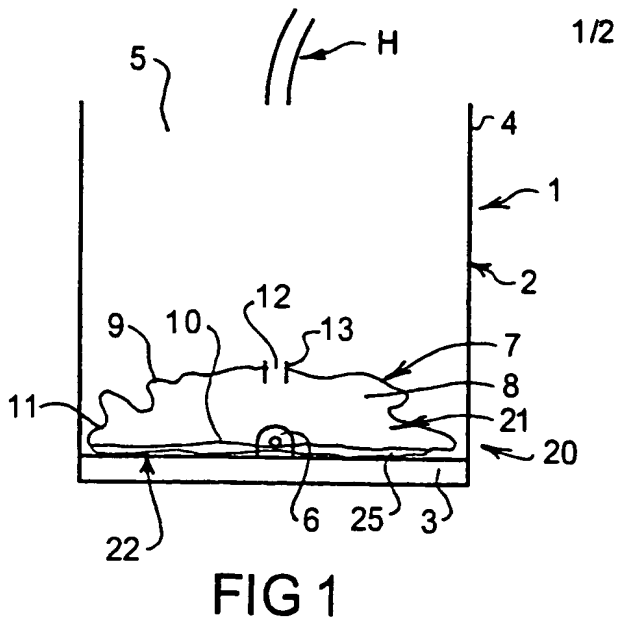
## Claims:

1. A container apparatus for handling fruit must, including: a rigid support structure; and, a flexible container for holding a quantity of fruit must, the holding container being supported by the support structure when holding the must, and the holding container having at least one opening through which at least juice of the must, or wine, is removed therefrom.
2. A container apparatus as claimed in claim 1, and further including control means for applying a force to the must causing the must juice or wine to flow out through the or at least one opening in the holding container.
3. A container apparatus as claimed in claim 2, wherein the control means is operable to apply a force to the must causing the must to be pressed and juice to be separated from fruit pulp and skins of the must.
4. A container apparatus as claimed in claim 2 or 3, wherein the control means includes a control member inflatable to press against the must.
5. A container apparatus as claimed in claim 4, wherein the control member includes an inflatable control container having a control compartment expandable under pressure of fluid introduced into the control compartment so as to inflate the control container.
6. A container apparatus as claimed in claim 5, wherein the control container is located between the holding container and the rigid support structure, the rigid support structure restraining the control container and controlling the direction of inflation of the control container toward the holding container so as to apply a force to the holding container and thereby apply the force to the must.
7. A container apparatus as claimed in claim 6, wherein the control container is located beneath the holding container, inflation of the control container causing the bottom of the holding container to progressively rise so as to press the must juice between the rising container bottom and a top of the holding container.
8. A container apparatus as claimed in claim 6, wherein the control container at least partially surrounds the holding container, inflation of the

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20. A container apparatus as claimed in claim 19, wherein the temperature control means includes a passageway adjacent the holding container, passage of heat exchange fluid through the passageway causing convected transfer of heat between the heat exchange fluid and the must in the holding container.
- 5 21. A container apparatus as claimed in claim 20 when appended to claim 5 or any claim appended thereto, wherein the passageway is provided by the control compartment, and the control container has at least two openings into the control compartment to enable flow of heat exchange fluid into and out of the openings, respectively.
- 10 22. A container apparatus as claimed in any preceding claim, wherein the rigid support structure includes a support base and at least one support wall upstanding from the base and together defining a storage space in which the holding container is located.
23. A container apparatus as claimed in claim 22, wherein the rigid support structure includes a support crate having a pallet support base and 4 support walls upstanding therefrom.
- 15 24. A container apparatus for handling fruit must, including a holding container composed of flexible sheet material for holding a quantity of fruit must, the holding container having at least one opening for removing at least juice of the must or wine, therefrom.
- 20 25. A flexible bag container for handling fruit must, the container including: a holding compartment for holding a quantity of fruit must; at least one opening from the holding compartment through which must is removed therefrom; a control compartment adjacent the holding compartment; and, at least one opening into the control compartment for introducing a pressing fluid so as to expand the control compartment and apply a force to the adjacent holding compartment causing at least juice of the must, or wine, to flow out through the or at least one opening from the holding compartment.
- 25 26. A flexible bag container for handling fruit must, the container including: a holding compartment for holding a quantity of fruit must; at least one opening from the holding compartment through which must is removed therefrom; a control compartment adjacent the holding compartment; and, at least one
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36. A flexible bag container for grape must fermentation, the container including: an inner bag for holding a quantity of grape must during fermentation; at least one opening from the inner bag through which ferment is removed therefrom; an outer bag containing the inner bag, the inner and outer  
5 bags being composed of sheet material having predetermined gas permeability characteristics for controlling gas flow between the grape must and the container exterior.
37. A method for handling fruit must, including: positioning a flexible holding container in a rigid support structure; pouring a quantity of fruit must into the  
10 holding container, the holding container being supported by the support structure; and, removing at least juice of the must, or wine, through an opening from the holding container.
38. A method as claimed in claim 37, and further including fermenting the must in the holding container, so that wine is removed through the opening  
15 from the holding container.
39. A method as claimed in claim 37 or 38, and further including applying a force to the must causing the must to be pressed and juice to be separated from fruit pulp and skins of the must.
40. A method as claimed in claim 39, wherein pressing the must forces the  
20 must juice or wine through the opening from the holding container.
41. A method as claimed in claim 39 or 40, wherein applying a force to the holding container includes introducing fluid under pressure into a control compartment of a control container causing the control compartment to expand so that the control container presses against the holding container.
- 25 42. A method as claimed in claim 41, wherein the control container inflates upwardly against the bottom of the holding container causing the bottom of the holding container to rise and press the must between the rising holding container bottom and a top of the holding container.
- 30 43. A method as claimed in claim 40, wherein the control container at least partially surrounds the holding container, and the fluid introduced into the control compartment causes the holding bag container to progressively deflate so as to press the must.



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/AU 00/01247

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int Cl <sup>7</sup> : B65D 83/62, 83/72, 88/16, 88/54, 88/74, 77/04, C12G 1/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) B65D 83/62, 83/72, 88/16, 77/06, 77/22, C12G 1/02, 1/028		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT 'container' or 'bag' or 'bladder' or 'liner' or 'lining' or 'flexible' 'must' or 'wine' or 'fruit' or 'ferment+' or 'juice'		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2767530 A (PEYRET et al.) 26 February 1999 See whole document	1-3, 22, 24, 37-40
X	GB 1380316 A (BRITISH VISQUEEN LIMITED) 15 January 1975 See whole document	1, 2, 24, 37, 38
X	WO 88/05815 A (BKG HOLDING LIMITED) 11 August 1988 See whole document	24
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" Document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 21 November 2000		Date of mailing of the international search report 29 NOV 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No.: (02) 6285 3929		Authorized officer  BARRY STEPHENS Telephone No.: (02) 6283 2106

### Information on patent family members

International application No.

PCT/AU 00/01247

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
FR	2767530	GB	1380316				
GB	1380316	AU	52391/73				
WO	88/05815	AU	11596/88	EP	299030	GB	8701952
		US	4902521				